14 OCT 1963

Chief, Technical Services Division
ATTN : Engineering Branch

Chief, Supply Division

Sequential Burning Fusee, Red (SN 1370-H00-7950)

25X1A REF : [redacted]

1. This office has received the referenced cable request
25X1A from the [redacted] to ship 1500 each of the subject item to Saigon. This materiel to date has not been established as a stock item because approved specifications and drawings have not been furnished this office. Therefore it is requested that your office initiate necessary action to furnish this materiel. Requisition 719-139-64 and cost authority 4137-7249-5210 apply.

2. In view of the increased demand for this item, it is further requested that this office be furnished specifications and drawings in order that we may take the necessary action to maintain adequate stock levels.

[redacted] 25X1A

Distribution:
Orig. & 1 - Addressee
1 - OL/SD/OAMB - official

25X1A OL/SD/OAMB [redacted] ajs/3286 (10 October 1963)

OL 6518

[redacted]

Seal file 1370-H00-7950

Specification No. 413
22 October 1963

PERFORMANCE, ASSEMBLY, AND PACKAGING SPECIFICATIONS FOR THE SEQUENTIAL BURNING FUSEE (RED, YELLOW, AND GREEN)

1. **Purpose:** The purpose of this specification is to insure that the sequential burning fusee is assembled and packaged in the prescribed manner.

2. **Markings:** No part of the fusee nor any component of the packaging shall carry any trademarks, names, specification numbers or other means of identification.

3. **Parts:** The fusee shall consist of the following parts and assemblies:

		Dwg. No.
3.1	Fusee Assembly	413 -100
3.2	Packaging	413 -500

4. **Materials:** All materials used in the assembly and packaging of the fusee shall be as specified on the drawing listed above.

5. **Finish:** The finish of the item shall be in accordance with the assembly drawing.

6. **Dimensions:** The dimensions of the item shall be in accordance with the assembly drawing.

7. **Assembly:**

7.1 **Fusee:**

7.1.1 Fusees must meet all requirements of the Bureau of Explosives specifications for Railway fusees/(a copy of this specification is attached) with the following exceptions: as revised 5/1/59.

7.1.2 There shall be no identifying printing on the paper tubes. This includes omission of date of manufacture and instructions.

7.1.3 A second prime button is added to the fusee for ignition transfer (see Dwg. No. 413-100). This prime does not get capped nor is it required to pass provisions of the water test. The exterior packaging provides the required protection.

7.1.4 The normal base closure is replaced by a 1/4" thick fiber wad punched with a 5/16" hole.

7.1.5 The prime should be flush or below flush with the outer surface of the wad to permit close joining of the fusees. The top prime is convex and fits into the end cavity. The complete ignition transfer between segments is approximately 2 minutes.

7.1.6 Fusees must exhibit competent workmanship typical of Railroad Fusees. Excessive chimneying, inadequate control over burning times, light color or intensity will be indications of rejection.

7.2 Coupler:

7.2.1 The 1-1/2 inch fiber coupler does not burn as rapidly as the fusee and the flame from the fusee is necessarily partially obscured for an additional 5/8 inch of fusee or an additional 50 seconds. The coupler must be a loose fit since the diameter of the fusees can vary.

7.3 The End Spike

7.3.1 The end spike is as depicted on Dwg. No. 413-100. A 12-penny nail is driven through a turned maple block. This, in turn, is placed into a standard coupler and pinned with two 1/2 inch long nails. Gluing is not satisfactory.

7.4 Substitution of Materials

7.4.1 Substitution of materials, particularly in the coupler and end spike, is allowed as long as the dimensional tolerances are maintained. The column should be as rigid as possible and self-supporting when spiked into hard ground.

8. Inspection:

8.1 A minimum of 5% shall be selected at random from a lot of not more than 200 for inspection by the contracting authority's inspector.

8.2 The selected units shall be visually examined for quality of workmanship and to insure that all necessary components are present in the package.

8.3 The color of the fusee wrapping shall be the color of the fusee, if i.e. red, yellow, or green.

8.4 An instruction sheet shall be included in each package.

8.5 A total of five complete sets of three fusees shall be functioned. The burning time of the assembled fusees (three fusees, two couplers, and one end spike) shall not be less than 30 minutes, except at elevated temperatures where times in the 25 - 30 minute range may be typical depending on the period of storage at the elevated temperature. Burning times shall not exceed 39 minutes at ambient temperatures. The mean light intensity shall be 70 candles and shall not be less than 50 candles for more than 25 consecutive seconds.

8.6 A total of three packages shall be dropped from a height of six feet onto a steel plate. The units shall not ignite on impact.

8.7 Packaged assemblies shall remain waterproof.

9. Rejection:

9.1 If more than two complete units are found to be unsatisfactory when tested in accordance with 8.4 and 8.5, the lot shall be rejected.

9.2 Rejections shall not preclude the manufacturer from correcting the conditions which form the basis of rejections, nor does it preclude the

manufacturer from reworking a rejected batch for resubmission to inspection and test. All units and lots reworked shall be so indicated to the inspector, who may select twice the quantity of samples submitted to test in the first inspection.

10. Packaging:

10.1 Each package shall contain the following items

10.1.1 Three each fusees (double primed)

10.1.2 Two each couplers (phenolic impregnated tubing 15/16 inch I.D. x 1/16 inch wall x 1-1/2 inch long).

10.1.3 One base assembly (a phenolic sleeve fitted with wooden plug and spike

10.2 The above items shall be enclosed in a paper bag 3 inches x 12 inches long with polyethylene liner suitable for heat sealing.

10.3 The sealed paper bag shall be enclosed in a cylindrical container 2-1/2 inches x 10 inches, asphalt impregnated paper with one aluminum ply. Package shall meet requirements of MIL-C-2439B. The top of the container shall have a spot of paint to indicate color of fusees contained inside.

INSTRUCTIONS FOR USE

W A R N I N G

ALWAYS POINT FUSEE AWAY FROM THE FACE AND BODY WHILE IGNITING AND AFTERWARDS. AFTER IGNITING, HOLD 5 SECONDS, BUT NOT MORE THAN 10 SECONDS BEFORE DROPPING.

1. The caps are removed from all fusees.
2. Couplers are positioned to hold the three fusees into a single length.
3. The spike is attached to the bottom fusee and pushed into the ground.
4. One cap is used to ignite the top fusee by rubbing the "scratch" surface across the prime button much like striking a safety match in reverse. Units then burn in sequence.

SPECIAL NOTES:

1. All large primes should be positioned up, that is, the "top" of each fusee has a large prime button.
2. Fusees can be fitted into a more rigid column by lightly tapping the base of each fusee against a hard surface to expand the end before assembly into the coupler.
3. The sparks and slag from these fusees can cause serious burns.

SPECIFICATION FOR RED RAILROAD FUSEES OR RED HIGHWAY FUSEES

SECTION I

General Requirements

1. The fusee shall consist of a tube of suitable material containing the flare composition along with a suitable means of ignition by friction, and with or without an approved means of support while burning.

2. The tube shall be colored red to indicate its burning color.

3. Directions for use, date of manufacture, and the name of the manufacturer shall be printed legibly on the tube of the fusee. The directions for use shall include the following instructions printed in plain block letters.

"ALWAYS POINT FUSEE AWAY FROM FACE AND BODY WHILE IGNITING AND AFTERWARDS. AFTER IGNITING HOLD 5 SECONDS BUT NOT MORE THAN 10 SECONDS BEFORE DROPPING."

For ten minute or longer fusees, letters of above quoted instructions must be not less than ⅛ in. high.

Fusees made in compliance with this specification should be marked "Complies with Bureau of Explosives' Specifications."

SECTION II

Specific Requirements

1. Fusees with a nominal burning time not exceeding 10 minutes shall have a maximum overall length of 14 in. and a maximum outside diameter of 1⅛ in. The 5 minute fusee shall have a maximum overall length of 9 in. and a maximum outside diameter of 1⅛ in.

2. The base of the fusee shall be suitably closed by means of a disc or plug or other approved design, such that the efficiency of the closure shall not be impaired when the fusee is dropped freely through a vertical distance of 20 ft. onto concrete so sloped that the angle of impact is 20 deg. to the vertical. Any equivalent testing procedure may be used subject to the approval of the purchaser. Bending of the spike, if present, shall not be considered in the interpretation of the above test for efficiency of closure. However, excessive bending is not desirable as the spike material must be of sufficient strength to stand up under conditions of use.

3. The entire rim of the head of the fusee shall be free from ignition compound.

4. The head of the fusee shall be protected by a removable cap not less than 1¾ in. long, which is so constructed that it is mechanically impossible for the inner surface of the cap to cause ignition or impair the efficiency of the ignition compound under normal conditions of handling.

5. The cap shall be securely fastened to the body of the fusee in such a manner that accidental detachment is impossible. Cap or fastenings must not obscure printed matter.

6. The cap shall be so constructed that after detachment it forms a suitable device for lighting the ignition composition by friction.

7. The ignition composition and the scratch surface shall be protected in such a manner that accidental exposure is impossible.

8. The completed fusee shall be of sufficient strength that it will not break when a weight is applied for 5 minutes as follows:

The fusee is placed on two supports having a flat bearing surface of ¼ in. width set 6 in. apart and a weight of 80 lb. applied at a point equidistant from the two supports through a looped wire under which is centrally placed a 1-in. wide half ring section of rigid metal tube not over 1¼ in. in diameter.

Where the length of fusee does not permit the above test, the following method shall be used:

The fusee is placed on two supports having a flat bearing surface of ¼ in. width set 4 in. apart and a weight of 120 lb. applied at a point equidistant from the two supports through a looped wire under which is centrally placed a 1-in. wide half ring section of rigid metal tube not over 1¼ in. in diameter.

NOTE:—Special approved break test may be required for fusees which have a nominal burning time in excess of 10 minutes.

9. To ensure efficient performance 80% of the fusees tested must not be extinguished when dropped at random from a height of 30 feet onto a hard surface after being ignited and held for 10 seconds.

10. (a) The ignition compound shall be waterproof and shall withstand immersion in water at 70°F. for 10 minutes without impairing the efficiency to the extent that it cannot be ignited by the usual means.

(b) The completed assembly shall withstand immersion in water at 70°F. for 10 minutes without impairing the efficiency to the extent that it cannot be ignited by the usual means.

11. The ignition or head composition shall be securely fastened to the fusee and shall withstand friction of the scratch cap without breaking or becoming detached in whole or in part from the fusee.

12. The fusee, after burning 10 seconds in air, shall burn not less than 2 minutes when submerged in water in a vertical position with head down.

13. The fusee shall not chimney in such a manner as to materially obscure the flame.

14. The composition of the fusee shall be such that spontaneous ignition does not occur when the moistened composition is exposed to a temperature of 212°F. for 72 consecutive hours.

15. Fusees containing sulphur shall not contain more than 2.6% potassium chlorate or an equivalent amount of any other chlorate.

16. Fusees containing chlorate shall not contain ammonium salts.

17. The ignition temperature of the igniter composition and flare color composition shall be not lower than 350°F. when determined by either of the following methods:

(a) After separation, the compositions shall be placed in separate looscly covered vessels (beakers) which shall be placed for one hour in an oven maintained at a temperature of 350°F. The compositions shall not ignite or explode during this period of incubation.

(b) A brass block 1″ x 1½″ x 10″ is used. Two rows of eight holes, ⅜″ diameter by ¾″ deep, are bored with centers about ½″ from and along the two long edges of the block. The rows start 3″ from both ends of the block and are spaced evenly in the center 4 inches. A hole for the thermometer is bored longitudinally through the exact center of the body of the block. The block is used over a shield and is heated by a burner fitted with a brass 'fishtail.' The procedure is as follows: About one gram portions of the flare composition are placed in several of the holes and tamped lightly with a glass rod. The temperature of the block is then raised at about 10°F. per minute to determine the 'approximate ignition temperature.' Starting again, the block is heated to a temperature about 25°-30°F. below the pre-determined approximate ignition temperature and the mixture then placed in the holes and tamped. The temperature is then raised at a rate of 5°F. per minute to the ignition temperature.

18. The completed fusee shall withstand incubation at 160°F. for 48 hours without ignition or significant decomposition.

SECTION III

Performance

1. Burning Time:

When ignited and placed at an angle of 20 deg. to the vertical (ignition end up) or in a horizontal position, fusees shall burn within the following limits:

Type	Minimum	Maximum
5 minute	5 minutes	6½ minutes
10 minute	10 minutes	13 minutes
15 minute	15 minutes	18 minutes
20 minute	20 minutes	23 minutes
30 minute	30 minutes	35 minutes

2. Color:

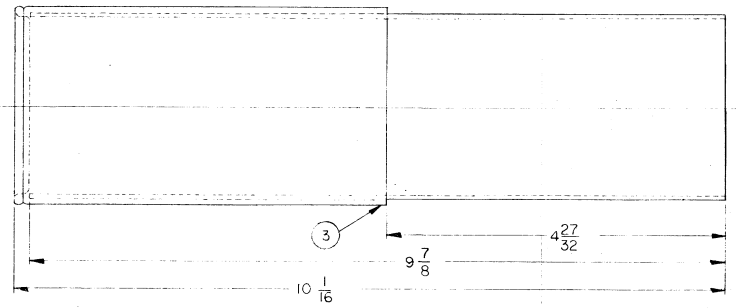
The color of the light from burning red fusees shall show values in terms of the I.C.I. Standard Observer and Coordinate System of not less than 0.61 for the X-coordinate and not more than 0.34 for the Y-coordinate for any of the determinations made during the positive flame emitting period.

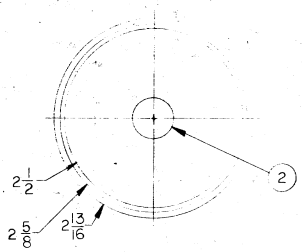
3. Intensity:

Except for the first and last 30 seconds of burning time which need not be considered, the mean intensity of the light emitted from a burning fusee shall be not less than 70 candles and shall be not less than 50 candles for more than any 25 consecutive seconds. This test to be conducted with fusee placed at an angle of 20° to the vertical (ignition end up) and sloping directly away from the photometer. The photometer shall be level with the flame and not less than 24 inches therefrom.

Revised May 1, 1959.

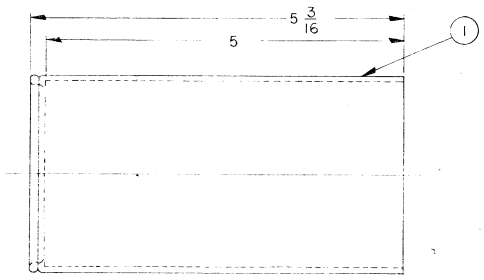
DATE	SYM	REVISION RECORD	AUTH	DR	CK

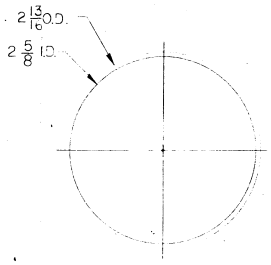




NOTES:

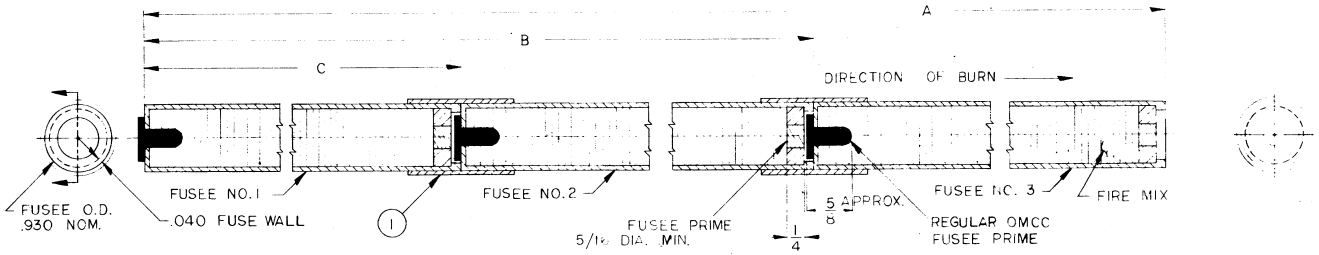
1. ASPHALT IMPREGNATED PAPER WITH ONE ALUMINUM PLY AS PER SPEC MIL-C-2439 AMENDMENT 1 MAR. 30, 1951 REQUIRMENTS
2. COLOR IDENTIFICATION PAINT (RED, GREEN, OR YELLOW AS REQ'D)
3. TO BE SEALED WITH CELLOPHANE TAPE.





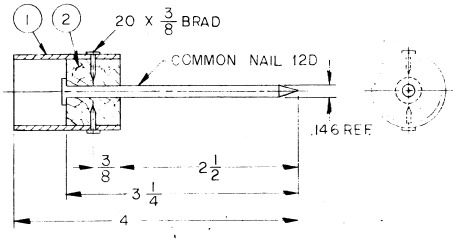
TOLERANCES (EXCEPT AS NOTED)			
DECIMAL ±		SCALE 1/1	DRAWN BY BEHRING
			APPROVED BY
FRACTIONAL ±	TITLE PACKAGING FOR SEQUENTIAL FUSEE		
ANGULAR ±	DATE 10 22 63	DRAWING NUMBER 413-500	

DATE	SYM	REVISION RECORD	AUTH	DR	CK

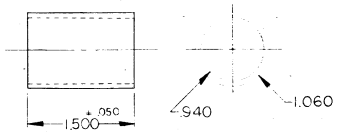


IGNITION TRANSFER METHOD

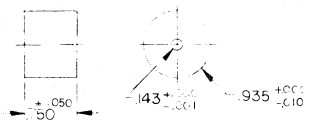
FUSEE LENGTH			
COLOR	A	B	C
RED	23 1/4	15 1/2	7 3/4
YELLOW	30 3/8	20 5/8	10 3/16
GREEN	33 3/16	22 7/8	11 1/16



BASE ASSEMBLY



1 FIBER COUPLING
MAT'L PAPER BASED PHENOLIC TUBING



2 WOOD PLUG
MAT'L: MAPLE
DOWELL-STOCK

TOLERANCES (EXCEPT AS NOTED)			
DECIMAL ±		SCALE 1/1	DRAWN BY BEHRING
			APPROVED BY
FRACTIONAL ±	TITLE ASSEMBLIES AND DETAILS OF SEQUENTIAL FUSEE		
ANGULAR ±	DATE 10-22-63	DRAWING NUMBER 413-100	